Replaced by Claim 19

CLAIMS

1. A display device for selectively discharging a plurality of discharge cells to display an image, characterized by comprising:

a display panel including said plurality of discharge cells;

a first driving circuit for applying a driving pulse to the selected discharge cell in said display panel to induce a first discharge; and

a second driving circuit for increasing, after the first discharge is at least weakened by reducing a voltage of said driving pulse, the voltage of the driving pulse again, to induce a second discharge subsequently to the first discharge.

2. The display device according to claim 1, characterized in that said second driving circuit induces said second discharge while a priming effect produced by said first discharge is obtained.

3. The display device according to claim 1, characterized in that an interval between the peak of said first discharge and the peak of said second discharge is not less than 100 ns nor more than 550 ns.

4. The display device according to claim 1, characterized in that said second driving circuit induces said second discharge after said first discharge is weakened and is completely terminated.

5. The display device according to claim 1, characterized in that the interval between the peak of said first discharge and the peak of said second discharge is not less than 300 ns nor more than 550 ns.

6. The display device according to claim 1, characterized in that the peak intensity of said second discharge is not less than the peak intensity of said first discharge.

7. The display device according to claim 1, characterized in that

said plurality of discharge cells respectively include capacitive loads, and

said first driving circuit comprises

an inductance circuit having at least one inductance element having its one end connected to said capacitive load, and

a resonance driving circuit for outputting said driving

pulse due to LC resonance by said capacitive load and said inductance element.

8. The display device according to claim 1, characterized in that said first driving circuit comprises a first capacitive element provided outside said display panel as a current supply source for said driving pulse, said first capacitive element recovering charges stored in said discharge cells.

9. The display device according to claim 1, characterized by further comprising a third driving circuit for increasing, after said second discharge is at least weakened by reducing the voltage of said driving pulse, the voltage of said driving pulse again, to induce a third discharge subsequently to said second discharge.

10. The display device according to claim 9, characterized in that said third driving circuit repeats an operation for increasing, after the discharge is at least weakened by reducing the voltage of the driving pulse, the voltage of the driving pulse again, to continuously induce a plurality of times of discharges subsequent to the second discharge.

11. The display device according to claim 8, characterized in that

said second driving circuit comprises

a second capacitive element provided outside said display panel as a current supply source for said driving pulse, and

a voltage source for charging said second capacitive element to a predetermined voltage.

12. The display device according to claim 1, characterized in that said driving pulse includes a driving pulse which makes the transmission from a first potential to a second potential and takes a maximal value and a minimal value at least once during the transition from the first potential to the second potential, and further comprising

a final driving circuit for driving said driving pulse such that the transition speed from the final extreme value to the second potential is lower than the transition speed from the first potential to an extreme value immediately after that and the transition speed from the subsequent extreme value to an extreme value immediately after that.

13. The display device according to claim 11, characterized in that

said final driving circuit comprises

a field effect transistor having its one end receiving said second potential, and

a current-limiting circuit for limiting a current of a control signal inputted to the gate of said field effect transistor.

13 ~~14~~. A display device for selectively discharging a plurality of discharge cells to display an image, characterized by comprising:

a display panel including said plurality of discharge cells;

a driving circuit for applying a driving pulse to the selected discharge cell in said display panel to induce a second discharge after inducing a first discharge;

a detection circuit for detecting the lighting rate of the discharge cells which are simultaneously turned on out of said plurality of discharge cells; and

a control circuit for controlling said driving circuit such that said driving pulse is changed depending on the lighting rate detected by said detection circuit.

14 ~~15~~. The display device according to claim 13 ~~14~~, characterized by further comprising

a conversion circuit for converting, in order to divide one field into a plurality of sub-fields and discharge the

selected discharge cell for each sub-field to make gray scale expression, image data in the one field into image data in each sub-field,

said detection circuit comprising a sub-field lighting rate detection circuit for detecting the lighting rate for each sub-field,

said control circuit controlling said driving circuit such that said driving pulse is changed depending on the lighting rate for each sub-field detected by said sub-field lighting rate detection circuit.

20 ~~16.~~ 13 The display device according to claim ~~14.~~ characterized in that

said driving circuit comprises

a first driving circuit for increasing the voltage of said driving pulse to induce said first discharge, and

a second driving circuit for increasing the voltage of said driving pulse again to induce said second discharge after inducing said first discharge, and

said control circuit controlling said second driving circuit such that said driving pulse is changed depending on the lighting rate detected by said detection circuit.

21 ~~17.~~ 20 The display device according to claim ~~16~~, characterized in that said second driving circuit increases,

after said first discharge is at least weakened by reducing the voltage of said driving pulse, the voltage of the driving pulse, to induce said second discharge subsequent to said first discharge.

22~~18~~. The display device according to claim 20~~16~~, characterized in that said control circuit changes the timing at which said second driving circuit increases the voltage of said driving pulse again depending on the lighting rate detected by said detection circuit.

23~~19~~. The display device according to claim 20~~16~~, characterized in that the higher the lighting rate detected by said detection circuit is, the later the timing at which said second driving circuit increases the voltage of said driving pulse again is.

24~~20~~. The display device according to claim 20~~16~~, characterized in that said control circuit controls, when the lighting rate detected by said detection circuit reaches not less than a predetermined value, said second driving circuit such that said second discharge is induced subsequently to said first discharge.

25~~21~~. The display device according to claim 20~~16~~,

characterized in that said control circuit controls said second driving circuit so as to delay the timing at which the voltage of the driving pulse is increased again with the increase in the lighting rate detected by said detection circuit, and advance the timing at which the voltage of said driving pulse is increased again when the lighting rate is increased to not less than the predetermined value.

26 ~~22~~. The display device according to claim 20 ~~16~~, characterized in that said control circuit controls said second driving circuit so as to switch the timing at which the second driving circuit increases the voltage of the driving pulse again when the lighting rate detected by said detection circuit reaches not less than a predetermined value and change the number of pulses composing the driving pulse applied to the selected discharge cell in the display panel such that luminance is approximately equal before and after the switching of the timing at which the voltage of the driving pulse is increased again.

36 ~~23~~. The display device according to claim 13 ~~14~~, characterized in that said control circuit controls said driving circuit such that the higher the lighting rate detected by said detection circuit is, the longer the period of said driving pulse is.

37 ~~24~~. The display device according to claim 13 ~~14~~, characterized in that said control circuit controls said driving circuit so as to switch the period of said driving pulse when the lighting rate detected by said detection circuit reaches not less than a predetermined value and change the number of pulses composing the driving pulse applied to the selected discharge cell in said display panel such that luminance is approximately equal before and after the switching of the period of said driving pulse.

15 ~~25~~. The display device according to claim 14 ~~15~~, characterized in that

said driving circuit applies, in the same sub-field, at least one of a first driving pulse for inducing a discharge once by applying one pulse and a second driving pulse for inducing said second discharge after inducing said first discharge, and

said control circuit controls said driving circuit so as to change the ratio of the number of times of application of said first driving pulse to the number of times of application of said second driving pulse depending on the lighting rate for each sub-field detected by said sub-field lighting rate detection circuit.

16 ~~26.~~ The display device according to claim ~~15.~~ 14 characterized in that

said driving circuit applies, in the same sub-field, at least one of a first driving pulse for inducing said first and second discharges at a first time interval and a second driving pulse for inducing said first and second discharges at a second time interval longer than the first time interval, and

said control circuit controls said driving circuit so as to change the ratio of the number of times of application of said first driving pulse to the number of times of application of said second driving pulse depending on the lighting rate for each sub-field detected by said sub-field lighting rate detection circuit.

17 ~~27.~~ The display device according to claim ~~26.~~ 16, characterized in that the period of said second driving pulse is longer than the period of said first driving pulse.

18 ~~28.~~ The display device according to claim ~~26.~~ 16, characterized in that said control circuit controls said driving circuit such that the higher the lighting rate for each sub-field detected by said sub-field lighting rate detection circuit is, the higher the ratio of the number of times of application of said second driving pulse to the

number of times of application of said first driving pulse becomes.

19 ~~29~~. The display device according to claim ~~26~~ 16, characterized in that said control circuit controls said driving circuit so as to increase the ratio of the number of times of application of said second driving pulse to the number of times of application of said first driving pulse with the increase in the lighting rate for each sub-field detected by said sub-field lighting rate detection circuit, and further decrease the ratio of the number of times of application of the second driving pulse to the number of times of application of the first driving pulse with the increase in the lighting rate when the lighting rate is increased to not less than a predetermined value.

21 ~~30~~. The display device according to claim ~~16~~ 20, characterized in that said first driving circuit comprises a first capacitive element provided outside said display panel as a current supply source for said driving pulse.

28 ~~31~~. The display device according to claim ~~30~~ 27, characterized in that said first capacitive element recovers charges stored in said discharge cell.

29 ~~32.~~ The display device according to claim 20 ~~16~~, characterized in that

said plurality of discharge cells respectively include capacitive loads, and

said first driving circuit comprises

an inductance circuit having at least one inductance element having its one end connected to said capacitive load, and

a resonance driving circuit for outputting said driving pulse due to LC resonance by said capacitive load and said inductance element.

30 ~~33.~~ The display device according to claim 29 ~~32~~, characterized in that said inductance circuit includes a variable inductance circuit capable of changing an inductance value, and further comprising

an inductance control circuit for changing the inductance value of said variable inductance circuit depending on the lighting rate detected by said detection circuit.

31 ~~34.~~ The display device according to claim 20 ~~16~~, characterized in that

said driving circuit further comprises a third driving circuit for increasing, after said second discharge is at

least weakened by reducing the voltage of said driving pulse, the voltage of said driving pulse, to induce a third discharge subsequently to said second discharge, and

said control circuit controls said third driving circuit such that said driving pulse is changed depending on the lighting rate detected by said detection circuit.

32 ~~35~~. The display device according to claim 31 ~~34~~, characterized in that

said third driving circuit repeats an operation for increasing the voltage of the driving pulse again after the discharge is at least weakened by reducing the voltage of the driving pulse, to continuously induce a plurality of times of discharges subsequent to the second discharge, and

said control circuit controls said third driving circuit such that said driving pulse is changed depending on the lighting rate detected by said detection circuit.

33 ~~36~~. The display device according to claim 31 ~~34~~, characterized in that

said second driving circuit comprises

a second capacitive element provided outside said display panel as a current supply source for said driving pulse, and

a voltage source for charging said second capacitive

element to a predetermined voltage.

34 ~~37~~. The display device according to claim 33 ~~36~~, characterized in that said voltage source includes a variable voltage source capable of changing its output voltage, and further comprising

a voltage control circuit for controlling the output voltage of said variable voltage source such that the higher the lighting rate detected by said detection circuit is, the lower a charging voltage for said second capacitive element becomes.

35 ~~38~~. The display device according to claim 33 ~~36~~, characterized in that said voltage source includes a variable voltage source capable of changing its output voltage, and further comprising

a potential detection circuit for detecting a potential of said driving pulse which is changed by said first discharge, and

a voltage control circuit for controlling an output voltage of said variable voltage source such that the larger the amount of change in the potential detected by said potential detection circuit is, the lower the charging voltage for said second capacitive element becomes.

38 ~~39~~. A method of selectively discharging a plurality of discharge cells to display an image, characterized by comprising the steps of:

applying a driving pulse to the selected discharge cell to induce a first discharge; and

increasing, after said first discharge is at least weakened by reducing a voltage of said driving pulse, the voltage of the driving pulse again, to induce a second discharge subsequently to the first discharge.

39 ~~40~~. The method of driving a display deice according to claim ~~39~~ 38, characterized by further comprising the step of

increasing, after said second discharge is at least weakened by reducing the voltage of said driving pulse, the voltage of the driving pulse again, to induce a third discharge subsequently to the second discharges.

40 ~~41~~. The method of driving a display deice according to claim ~~40~~ 39, characterized in that the step of inducing said third discharge further comprises the step of repeating an operation for increasing, after the discharge is at least weakened by reducing the voltage of said driving pulse, the voltage of the driving pulse again, to continuously induce a plurality of times of discharges subsequently to the second discharge.

41 ~~42~~. The method of driving a display device according to claim ~~39~~ 38, characterized in that said driving pulse includes a driving pulse which makes the transition from a first potential to a second potential and takes a maximal value and a minimal value at least once during the transition from the first potential to the second potential, and further comprising the step of

driving said driving pulse such that the transition speed from the final extreme value to the second potential is lower than the transition speed from the first potential to an extreme value immediately after that and the transition speed from the subsequent extreme value to an extreme value immediately after that.

42 ~~43~~. A method of selectively discharging a plurality of discharge cells to display an image, characterized by comprising the steps of:

detecting the lighting rate of the discharge cells which are simultaneously turned on out of said plurality of discharge cells; and

changing said driving pulse depending on the lighting rate detected by said detecting step to apply the driving pulse to the selected discharge cell, and inducing a second discharge after inducing a first discharge.

43 ~~44~~. The method of driving a display deice according to claim ~~43~~ 42, characterized in that

the step of inducing said first and second discharges comprises the steps of

increasing the voltage of the driving pulse applied to the selected discharge cell, to induce the first discharge, and

increasing the voltage of said driving pulse again to induce said second discharge after inducing said first discharge, and changing said driving pulse depending on the lighting rate detected by said detecting step.

44 ~~45~~. The method of driving a display deice according to claim ~~44~~ 43, characterized in that the step of inducing said second discharge comprises the step of increasing, after said first discharge is at least weakened by reducing the voltage of said driving pulse, the voltage of the driving pulse again, to induce the second discharge subsequently to the first discharge, and changing the timing at which the voltage of said driving pulse is increased again depending on the lighting rate detected by said detecting step.